

WHAT IS CLAIMED IS:

Sub A2
5 1. An optical head device comprising:
a first light source for emitting a light beam of
a first wavelength;

a second light source which emits a light beam of
a second wavelength differing from said first
wavelength;

a single block wherein the first and the second
light source are aligned thereon; and

10 a diffraction grating which is provided on the
optical path between said first light source and an
objective lens and on the optical path between said
second light source and the objective lens and which
has a first-order diffraction efficiency of almost zero
15 for the light beam from said first light source and
emits the first-order diffraction light for the light
beam from said second light source.

20 2. The optical head device according to claim 1,
wherein the depth h_0 of the grating groove of said
diffraction grating is expressed by

$$h_0 = m \cdot \lambda_1 / (n - 1)$$

where n is the refractive index of said
diffraction grating, λ_1 is the wavelength of said
first light source, and m is a natural number.

25 3. The optical head device according to claim 2,
wherein said m is 1.

4. The optical head device according to claim 1,

00016364.074300

wherein the first-order diffraction light from said second light source is used to sense a tracking error signal.

5 5. The optical head device according to any one of claims 1 to 4, wherein said first light source and second light source are a multi-wavelength semiconductor laser array.

6. An optical head device comprising:

10 a first light source for emitting a light beam of a first wavelength;

 a second light source which emits a light beam of a second wavelength differing from said first wavelength;

15 a single block wherein the first and the second light source are aligned thereon;

 a first diffraction grating which has a first-order diffraction efficiency of almost zero for the light beam from said first light source and emits the first-order diffraction light for the light beam from
20 said second light source; and

 a second diffraction grating which emits the first-order diffraction light for the light beam from said first light source and has a first-order diffraction efficiency of almost zero for the light
25 beam from said second light source.

7. The optical head device according to claim 6, wherein the depth h01 of the grating groove of said

Sub P2
Cont

00616364.071300

first diffraction grating is expressed by

$$h01 = m \cdot \lambda 1 / (n1 - 1) \text{ and}$$

the depth h02 of the grating groove of said second diffraction grating is expressed by

5
$$h02 = m \cdot \lambda 2 / (n2 - 1)$$

where n1 is the refractive index of said first diffraction grating, n2 is the refractive index of said second diffraction grating, $\lambda 1$ is the wavelength of said first light source, $\lambda 2$ is the wavelength of said second light source, and m1 and m2 are natural numbers.

10

8. The optical head device according to claim 7, wherein at least one of said m1 and m2 is 1.

9. The optical head device according to any one of claims 6, 7 and 8, wherein said first diffraction grating and said second diffraction grating are formed integrally on a substrate.

15

10. An optical head device comprising:

a first light source for emitting a light beam of a first wavelength;

20 a second light source which emits a light beam of a second wavelength differing from said first wavelength;

a single block wherein the first and the second light source are aligned thereon; and

25 a hologram which projects a light beam onto a recording medium and directs the reflected light from the recording medium to a photodetector, wherein

00616364, 071300

11. The optical head device according to claim 10,
wherein said nonpolarization hologram has
an asymmetrical grating.

13. The optical head device according to claim 10, wherein said nonpolarization hologram has an asymmetrical stepwise grating.

a second light source which emits a light beam of
a second wavelength differing from said first
wavelength;

the optical axis of said objective lens is positioned asymmetrically with the optical axes of said first and second light sources.

25 15. The optical head device according to claim 13,
wherein said recording medium includes a first disk to
be read from when said first light source is used and

0616364-071300

5

10

15

20

25

a single block wherein the first and the second light source are aligned thereon; and

the position of the optical axis of said objective

Sub A2
Cont

5

10

15

20

25

25

25

a second light source which emits a light beam of

09616364 071300

5

10

15

20

25

23. The optical head device according to claim 21, wherein, if the distance between the center of said hologram and the optical axis of said first light source is $\delta 1$ and the distance between the center of

Sub A2
Con 4

said hologram and the optical axis of said second light source is $\delta 2$ in a projection plane in the direction of the optical axis of said objective lens, the expression $\delta 1 < \delta 2$ is almost satisfied.

5 24. The optical head device according to claim 21, wherein said hologram is used to sense a shift in focus by a mixed aberration method.

25. An optical head device comprising:

10 a first light source for emitting a light beam of a first wavelength;

 a second light source which emits a light beam of a second wavelength differing from said first wavelength;

15 a single block wherein the first and the second light source are aligned thereon;

 an objective lens for causing the laser light from said first or second light source to converge on an optical disk; and

20 a hologram for diffracting the light reflected from said optical disk and returned through said objective lens and directing the reflected light to a light-receiving element, wherein

 if the distance between said first light source and said second light source is δ , the distance between said first and second light sources and said hologram
25 is in the range from 20δ to 40δ .

26. The optical head device according to claim 25,

09616364-071300

wherein said hologram is a nonpolarization hologram.

27. An optical head device comprising:

a first light source for emitting a light beam of
a first wavelength;

5 a second light source which emits a light beam of
a second wavelength differing from said first
wavelength;

an objective lens for causing the laser light from
said first or second light source to converge on an
10 optical disk;

a single block wherein the first and the second
light source are aligned thereon; and

a hologram for diffracting the light reflected
from said optical disk and returned through said
15 objective lens and directing the reflected light to
a light-receiving element, wherein

said hologram has a first marker attached to the
projected position in the direction of the optical axis
of said second light source, the first marker serving
20 as a mark in installing said hologram.

28. An optical head device comprising:

a first light source for emitting a light beam of
a first wavelength;

25 a second light source which emits a light beam of
a second wavelength differing from said first
wavelength;

an objective lens for causing the laser light

Sub A2
Cont 7

09616364-071300

from said first or second light source to converge on an optical disk;

a single block wherein the first and the second light source are aligned thereon; and

5 a hologram for diffracting the light reflected from said optical disk and returned through said objective lens and directing the reflected light to a light-receiving element, wherein

10 said hologram has a first marker attached to the position of the midpoint between the projected position in the direction of the optical axis of said first light source and the projected position in the direction of the optical axis of said second light source, the first marker serving as a mark in
15 installing said hologram.

29. The optical head device according to any one of claims 26 and 27, wherein, if the numerical aperture when the light beam from said first light source is used is NA1 and the numerical aperture when the light
20 beam from said second light source is used is NA2, the expression $NA1 > NA2$ is satisfied.

30. The optical head device according to any one of claims 27 and 28, wherein said hologram has a second marker attached to the position corresponding
25 to an optical axis extending to any point on said light-receiving element.

31. The optical head device according to claim 30,

Sub A2
Cont

09616364-071300

wherein said any point is the center of said light-receiving element.

32. The optical head device according to claim 30, wherein said any point is the marker provided on said light-receiving element.

33. A disk drive system comprising:

a first light source for emitting a light beam of a first wavelength;

a second light source which emits a light beam of a second wavelength differing from said first wavelength;

a single block wherein the first and the second light source are aligned thereon; and

a diffraction grating which is placed on the optical path between said first light source and an objective lens and on the optical path between said second light source and the objective and which produces almost 100% of the 0-order diffraction light for the light beam from said first light source and has a first-order diffraction efficiency of almost zero and emits the 0-order and first-order diffraction light for the light beam from said second light source;

a hologram which is placed on the optical path between said objective lens and said diffraction grating and directs the light projected on an optical disk via said objective lens and reflected from the optical disk via said objective to a light-receiving

Sub A2
Con 4

00616364.071300

5

10

00616-16-07-03